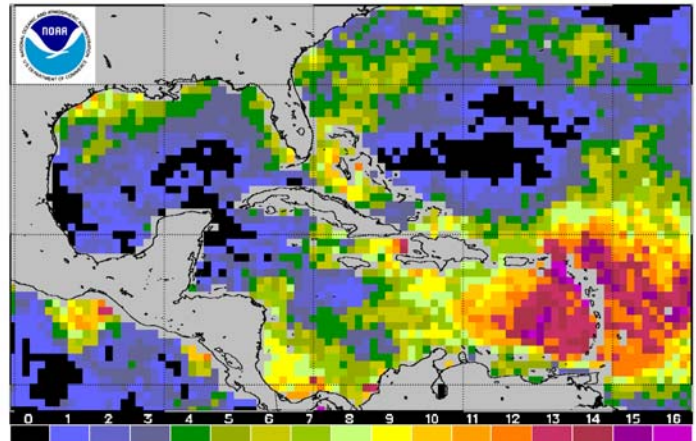


# Federal Response to the 2005 Caribbean Bleaching Event

A major coral bleaching event occurred in the Caribbean in 2005, and has resulted in significant coral death in much of the region. NOAA Coral Reef Watch first alerted managers and scientists about possible bleaching conditions in the Florida Keys in August 2005, and issued warnings for both Puerto Rico and the US Virgin Islands (USVI) in October 2005. Anomalously warm water was centered around the northern Antilles near the USVI and Puerto Rico; thermal stress reached Degree Heating Week (DHWs) values of over 15 at some locations (Figure 1). Corresponding with these alerts, reports of coral bleaching have come in from much of the Caribbean (Figure 2); this is clearly an important, widespread event.

The US Coral Reef Task Force (USCRTF) passed a resolution at its November meeting in Palau to mobilize efforts across the Caribbean to monitor and assess short- and long-term impacts of the 2005 warming and bleaching event. The USCRTF Bleaching Committee has coordinated the efforts of NOAA, NASA, and DOI personnel, as well as other federal agencies, NGO partners, and local managers. The outcomes of the initial meetings include the development of a 3-phase response approach including an initial response, near-term reporting and assessment, and long-term monitoring.

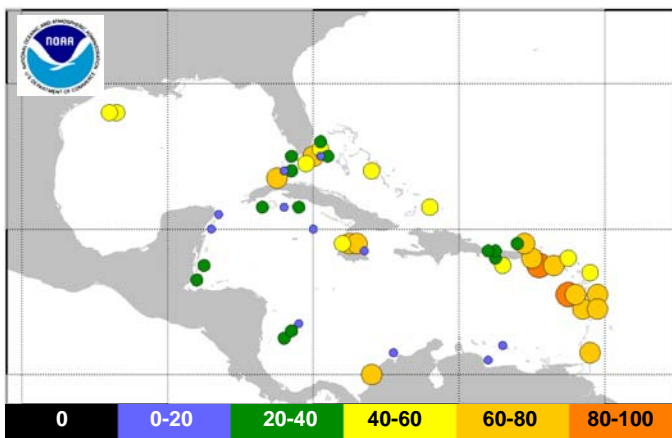


**Figure 1:** 2005 annual composite of maximum Degree Heating Weeks. Each DHW represents one week of temperatures 1°C above the maximum highest monthly average. Values of 4 result in bleaching; 8 results in mass bleaching and mortality.



## NOAA's Response

As part of the initial response, a workshop was held in the US Virgin Islands, hosted by NOAA and The Nature Conservancy. Over 40 marine park managers and coral reef scientists from USVI, Puerto Rico, the British Virgin Islands, and the French West Indies attended. The workshop was highly successful in coordinating the ongoing regional response to the unprecedented 2005 bleaching event in the Caribbean.



**Figure 2:** Percentage of coral colonies bleached by Caribbean satellite pixel.

Participants from USVI and Puerto Rico have committed to meet, form regional teams, draft response plans outlining the geographical responsibilities of each researcher/field team, and develop a plan of action (from funding to field activities to outputs) before bleaching occurs again.

As part of the near-term response, NOAA is leading an international collaborative effort to fully document the extent of the event. Preliminary results of more than 1500 bleaching surveys from 100 researchers in 25 jurisdictions indicate severe bleaching throughout the eastern Caribbean (Figure 2), with over 25% mortality due to bleaching in a few locations.



## Dept. of Interior's Response

bleaching event; 5 of the 6 sites experienced >90% bleaching of coral cover (Figure 3). 100 of these transects have been periodically monitored to quantify the extent of the recovery of the reefs. Together with USGS scientists, additional surveys quantified coral mortality from disease. This bleaching episode was followed immediately by a severe outbreak of coral disease that affected primarily the major reef building species (e.g.: brain and star corals). Coral cover studies reveal >40% loss at Tektite Reef and >20% loss at Haulover Reef, and extensive disease mortality at depths ranging from 10-100 feet.

Elkhorn coral (*Acropora palmata*) is now nominated to be listed as threatened under the Endangered Species Act because of extensive losses from disease and hurricanes since the 1970s. In the last 15 years, new elkhorn colonies have begun to grow on many Caribbean reefs. During the recent bleaching episode, elkhorn coral bleached for the first time on record in the US Virgin Islands. Bleaching led directly to the death of many colonies. Of the over 460 elkhorn colonies that are being monitored at four reefs in Virgin Islands National Park by USGS, NPS and the University of the Virgin Islands scientists, about 45% bleached, 13% died partially, and 8% died completely.



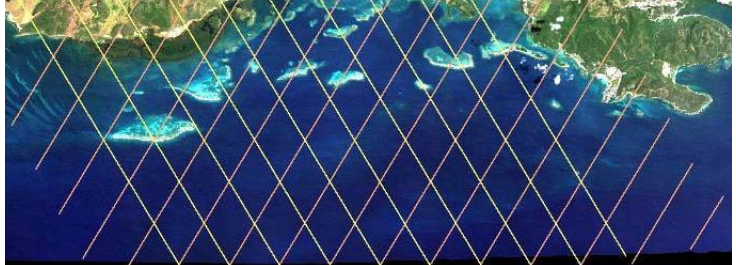
**Figure 3:** Bleached elkhorn coral, Buck Island Reef National Monument.



## NASA's Response

instrument that captures visible and infrared light data (Figure 4). The aircraft-based sensors provide higher spectral and spatial resolution data and can be used to enhance understanding of ocean biology satellite data. These data will help us to document the extent of the bleaching and to prepare for monitoring future bleaching events.

Parallel field efforts to collect related data complemented the flyovers, including: atmospheric calibration of AVIRIS data for benthic classification, and analysis of airborne data to detect coral bleaching.



**Figure 4:** AVIRIS flight lines for La Parguera, Puerto Rico.

This event exemplifies the importance of proactive management actions known to prevent or minimize reef damage, such as monitoring, marine protected areas, community outreach, and enforcement.

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<http://www1.nature.nps.gov/im/units/sfcn/coral.htm>

<http://geo.arc.nasa.gov/sge/coral-health/>